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FIRE EXTINGUISHER, CONTAINER FOR FIRE EXTINGUISHING LIQUIDS AND OTHER
FLUIDS, AND METHOD FOR MAKING THE SAME
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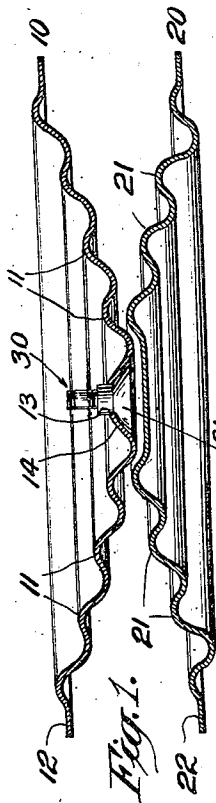


Fig. 1.

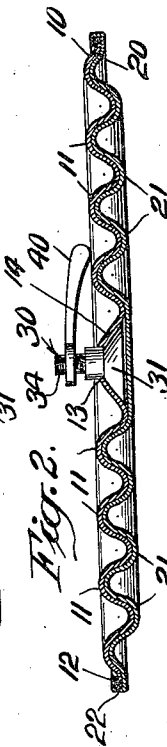


Fig. 2.

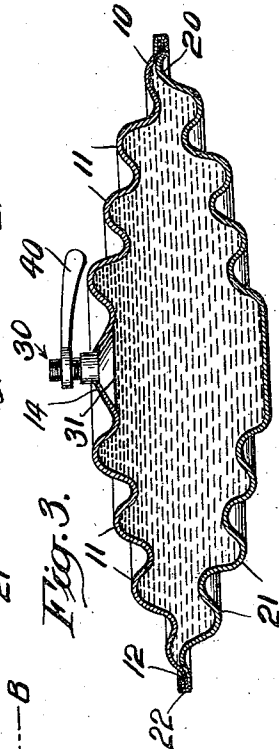


Fig. 3.

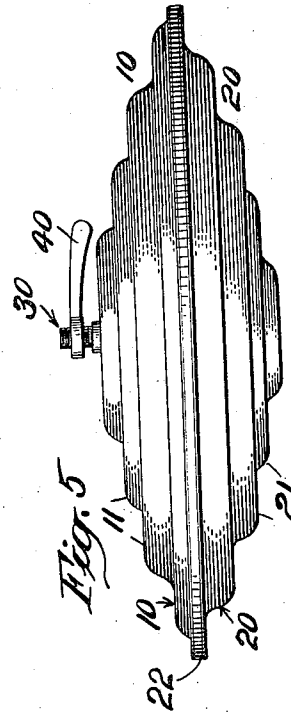


Fig. 5.

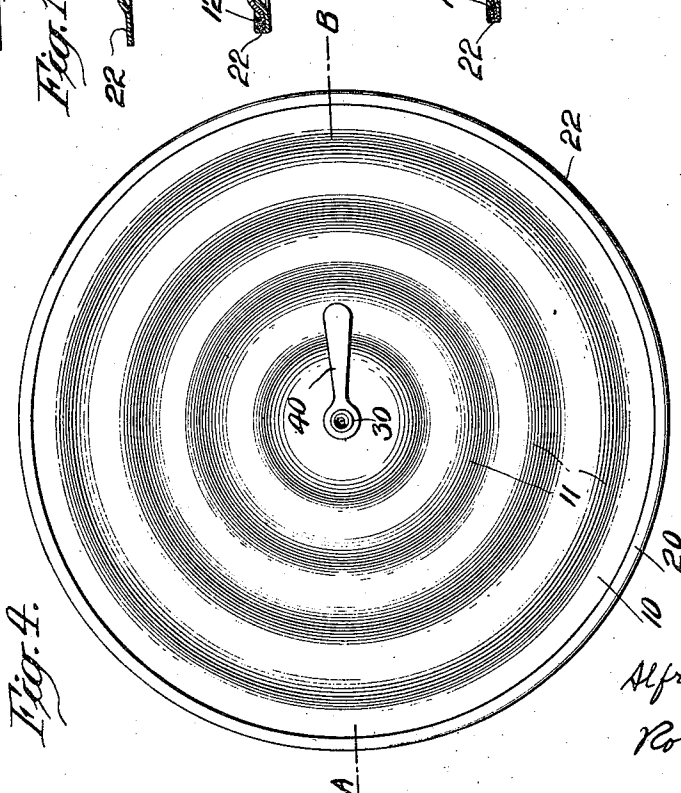


Fig. 4.

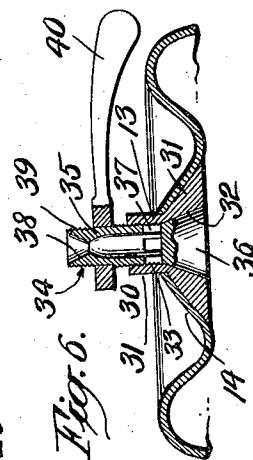


Fig. 6.

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UNITED STATES PATENT OFFICE.

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FIRE EXTINGUISHER, CONTAINER FOR FIRE-EXTINGUISHING LIQUIDS AND OTHER FLUIDS, AND METHOD FOR MAKING THE SAME.

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This invention relates to fire extinguishers, containers for fire extinguishing liquids and other fluids, and methods for making the same, and has for an object to provide a simple, reliable fire extinguisher containing a fire-extinguishing liquid which is maintained always under pressure so that it may be projected upon a fire by the mere opening of a valve. A further object of the invention is to provide a simple and economical method of making such an extinguisher.

It has long been recognized that carbon tetrachloride is a liquid of high efficiency in extinguishing fire and that a small quantity of this liquid may be used with great effect, provided that it is projected directly upon the fire. The apparatus heretofore provided for projecting this liquid upon a fire has commonly included a pump, and has the disadvantage of requiring the operator to work the pump handle while the liquid is being projected so that he is not able to take an accurate aim. Furthermore, such pumps are expensive to manufacture and have made the cost of the extinguishers containing them extremely high in relation to the value of the liquid contained in them. To avoid the disadvantages of including a pump in the extinguisher, it has been attempted to keep the liquid constantly under pressure by placing it in a closed receptacle and filling a portion of the receptacle with compressed air or other gas. Such fire extinguishers have proven unreliable since the gas pressure cannot be retained over long periods of time because of the tendency of the gas under pressure to ooze through the walls of the container.

In accordance with my invention, a body of fire extinguishing liquid which is preferably carbon tetrachloride, or a liquid containing carbon tetrachloride, is enclosed within a closed container which it completely fills. All or a part of the container is made of flexible sheet material, and so formed that the internal volume of the container may be varied by a bending of this flexible sheet material. Means are provided which tend to cause such a bending of the flexible sheet material as reduces the volume of the container, and the body of fire ex-

tinguishing liquid within the container is thus maintained constantly under pressure so that it may be projected upon a fire at any time by merely opening a valve in the receptacle. Since the variation in the volume of the container is obtained by a bending of the container or parts thereof, the container may be made of sheet material which, while flexible, is substantially inextensible and uncontractable, such, for example, as flexible sheet metal. The container is most desirably constructed entirely of sheet metal of which all or a portion is flexible.

An important feature of the invention consists in causing the bending of the flexible portion of the container to reduce the volume of the container, by inherent resiliency of the sheet material from which all or a part of the container is made. This is accomplished by making all or a part of the container of resilient flexible material, as, for example, of spring metal, and forming this material so that in its normal position, to which it tends to return, the volume of the container is materially less than the volume of fluid which is forced into it, so that the fluid in the container is maintained constantly under pressure by the inherent resiliency of the material of which the container or a part thereof is constructed.

By a further feature of the invention, hereinafter explained in detail, the resilient sheet material of which all or a part of the container is formed may be given a normal shape such that the normal volume of the container is substantially equal to zero, so that when the outlet of the container is opened substantially all the fluid therein contained may be ejected by the inherent resiliency of the material of which the container is made.

The receptacle or container of an improved form of fire extinguisher incorporating the invention includes a plate of flexible and resilient but substantially inextensible and uncontractable sheet material. The plate is made extensible and contractable along lines radiating from its central portion by forming concentric corrugations in it. Consequently, the plate may be curved so as to bring its central portion out of the

plane of the periphery of the plate. The liquid is forced into the container under pressure curving the plate outward away from its normal form. The tendency of the plate to return to its normal form because of its inherent resiliency keeps the liquid under pressure. A further feature of the invention comprises making the normal form of the resilient plate such that when the container is empty the central portion of the plate is pressed forcibly against the inner surface of the opposite wall of the container by its inherent resiliency so that pressure upon the liquid is maintained throughout the discharge of the liquid from the container.

The container in itself forms a part of my invention and while it is an important element in the new fire extinguisher, it may be used also for other purposes.

In order that the invention may clearly be understood I will describe in detail a fire extinguisher embodying it which is illustrated in the accompanying drawings and a method of making the fire extinguisher shown, which method also embodies the invention.

In the drawings:—

Figs. 1, 2 and 3 are sectional views taken upon the plane A—B of Fig. 4 and illustrating respectively successive stages in the making of the extinguisher;

Fig. 4 is a top view and Fig. 5 a side view of the completed extinguisher; and

Fig. 6 is a fragmentary sectional view upon a larger scale showing the construction of the valve.

The container of the extinguisher illustrated is made from two plates of sheet material. One, and more desirably both, of the plates consists of resilient sheet metal and is made extensible and contractable along lines radiating from its central portion by forming in its concentric corrugations. The periphery of each plate is preferably in the form of a continuous unbroken curve and each of the corrugations have this same form. To make the container the plates are secured together about their peripheries. The central portions of the plates are then spread apart by forcing between them a liquid introduced under pressure. The resiliency of the plate which is formed of resilient material, or of both plates, if they are both formed of such material, causes a continuous pressure upon the liquid between the plates which serves to eject the liquid when the container is opened. A further feature of the invention which results in maintaining the liquid under pressure throughout the time that it is being discharged from the container, consists in giving one or both of the plates a normal inward curvature which causes the central portions of the plates to be pressed together

by the resiliency of the material when the peripheries of the plates are brought together.

In the precise form illustrated in the drawings the container of the extinguisher is made from two circular plates 10, 20 of resilient sheet material. The most desirable material for the purpose is spring steel. Each plate is heated and pressed while hot so as to give it a substantially spherically curved form and at the same time to form in its curved surface concentric corrugations 11, 21. The outermost of the corrugations 11 of the plate 10 is spaced inwardly from the edge of the plate so as to leave an uncorrugated peripheral flange 12. The plate 20 has a similar peripheral flange 22. For a reason hereinafter explained, the corrugations 11 and 21 correspond in form so that they fit together when the normally convex surfaces of the plates are brought together in a manner hereinafter explained. After this hot pressing, the plates 10, 20 are tempered so as to give the steel of which they are made a high degree of resiliency. It is, however, unnecessary to make the portions of the plates forming the peripheral flanges 11 and 21 resilient and the tempering is most desirably effected in such manner as to leave these flanges comparatively soft. The tempering of spring steel being well understood, it is unnecessary to state herein the details of this step in the method.

The procedure thus far described results in giving each of the plates 10, 20 the normally curved form which is illustrated in Fig. 1.

Before the next step in the method, and if desired before the tempering is effected, a valve 30 is inserted in one of the plates. While it should be understood that the invention is by no means limited to the use of any particular type of valve or to the insertion of the valve in any particular part of either plate, the valve illustrated in the drawing and the method of inserting this valve will be described for the purpose of illustration. As best seen in Fig. 6, the valve 30 has an outer or body portion 31 which is provided with a central bore, the inner portion of which forms a conical valve seat 32, while the outer portion 33 is threaded. The inner member 34 of the valve includes a hollow outer stem portion 35 and a solid inner portion 36 which has a conical valve surface corresponding to the conical valve seat 32. The inner portion of the valve stem 35 is externally threaded and screwed into the threaded portion 33 of the bore of the body 31. Lateral openings 37 are provided near the inner end of the valve stem 35. The bore in the valve stem is formed to provide a nozzle 38 at its outer end. The outer surface of the outer end of the valve stem 34 is most desirably provided with an

external screw thread 39, this thread being formed in the opposite direction from the thread at the inner end of the valve stem. A handle 40 is applied to the valve stem between its two threaded portions.

In order to provide for the insertion of a valve of the type illustrated, one of the plates, for example, the plate 10, is provided at its center with a hole 13, and the portion of the plate surrounding the hole 13 is pressed outwardly to form a boss 14 as illustrated in Fig. 1. The hole 13 and the boss 14 may conveniently be formed during the hereinbefore described hot pressing of the plate 10. After the valve 30, with the exception of the handle 40, which is applied later, has been assembled, by screwing the inner portion 34 into the valve body from the bottom, the valve is inserted in the hole 13 in the plate 10. The inner portion of the valve body 31 substantially fills the space provided inside the boss 14 and fits closely against the inner surface of the boss. The valve body is then secured to the boss by brazing, or in other known manner.

The next step in making the extinguisher consists in placing the plates 10 and 20 with their convex sides towards each other, that is, in the position illustrated in Fig. 1. The plates are then forced together by a press applying sufficient pressure to overcome the inherent resiliency of the plates. This pressing is done while the plates are cold. While the plates are held together by the pressure applied by the press, the peripheral flanges 11, 21 are secured together. This may be accomplished by turning the flanges over and crimping them together so that they are given the form illustrated in Figs. 2 and 3. After the flanges have been secured together, the force of the press is released, and the container has the form shown in Fig. 2. It should be noted that when in this condition, the internal volume of the container is substantially equal to zero as the two plates fit together closely. Furthermore, the two plates are constantly pressed together by their own resiliency which gives them a tendency to resume their original form shown in Fig. 1, and consequently forces the central part of each plate against that of the other.

After the making of the container as above described, the next step consists in filling it with carbon tetrachloride or other fire-extinguishing liquid. Before this is done, however, the handle 40 should be applied to the valve stem 35. The filling is effected by connecting the valve stem 35 with a supply of liquid under pressure and opening the valve 30 by screwing the valve stem inwardly in the valve body. The liquid may be supplied through a pipe having an internal thread on its outer end and the thread 39 of the valve stem may be screwed into

this pipe by turning the handle 40 which at the same time screws the valve stem inwardly in the valve body opening the valve. The liquid under pressure passes through the bore of the valve stem 35, through the lateral openings 37, between the seat 32 and the conical portion 36, and enters between the plates 10, 20. The liquid spreads the plates apart bending each of them in the reverse direction from its normal curvature. When the desired quantity of liquid has been introduced, the supply of liquid is shut off and the valve stem 35 is screwed outwardly closing the valve and disconnecting the valve stem from the liquid supply. The extinguisher then has the form shown in Figs. 3, 4 and 5. The inherent resiliency of the plates 10 and 20 tends to cause them to reassume their original form and in consequence causes each of them to press inwardly against the liquid in the container. The liquid, therefore, is constantly retained under pressure by the inherent resiliency of the container. In order to use the extinguisher it is merely necessary to turn the handle 40 so as to open the valve 30 and direct the nozzle 38 towards the fire. When this is done the pressure of the plates will force the liquid through the nozzle. The pressure of the plates upon the liquid is continued throughout the discharge of the contents of the container. The user of the extinguisher is not required to pump while operating it and thus may direct his entire attention to pointing the nozzle accurately toward the fire.

The extinguisher is dependable and remains ready for use over long periods as a liquid under pressure does not ooze through a metal container as does a gas. Furthermore, should any slight leakage occur in the valve or elsewhere in the container the liquid will be forced out and the container will flatten out so that the fact that a leak has occurred may be at once detected by a casual inspection.

Many changes may be made in the particular embodiment illustrated without departing from the scope of the invention. Thus the form and shape of the container shown may be changed. Any desired form of valve may be used in the extinguisher and the valve may be inserted in any part of the container. The parts of the container may be secured together in any known manner, as, for example, by electric welding instead of crimping. I shall not, however, endeavor to set out all the changes which may be made in the device shown without departing from my invention.

I claim as my invention:

1. In a fire extinguisher, a closed container having a resilient wall normally forced against the opposite wall of the container by its inherent resiliency.

2. In a fire extinguisher, a closed container having opposite resilient walls normally forced against each other by their inherent resiliency.

5 3. A container formed from two plates secured together at their peripheries, one of said plates being made of resilient sheet metal and being expandible and contractable in directions perpendicular to its periphery, and one of said plates being normally inwardly curved so that the central portions of said plates are pressed together by the inherent resiliency of the resilient plate when the container is empty.

15 4. A container formed from two concentrically corrugated spring metal plates secured together about their peripheries, one of said plates having a normal inward curvature such that the central portions of the plates are pressed together by the inherent resiliency of the plates when the container is empty.

25 5. A container formed from two concentrically corrugated normally curved, spring-metal plates secured together about their peripheries with their normally convex sides inward.

30 6. A method of making a fire extinguisher, comprising forcing together two plates, one of which is inwardly curved and one of which is formed of resilient sheet metal by applying external pressure sufficient to overcome the resiliency of the resilient plate, securing the plates together about their peripheries while the plates are held together by the external pressure, discontinuing the external pressure, and forcing a body of fire-extinguishing liquid between the plates.

40 7. A method of making a new article of manufacture, comprising forcing together the convex sides of two curved spring-metal plates by applying external pressure sufficient to overcome the resiliency of the plates,

securing the plates together around their peripheries while they are held together by the external pressure, discontinuing the external pressure, and curving each of the plates in the reverse direction from its normal curvature by pressure applied to the inner sides of the plates.

8. A method of making a container, comprising pressing a plate of spring steel into curved form and forming concentric corrugations therein, tempering said plate so as to make it resilient, forcing the convex side of said plate against the side of another plate by applying external pressure sufficient to overcome the resiliency of the resilient plate, and securing the plates together about their peripheries while the plates are held together by the external pressure.

9. A fire extinguisher, comprising a corrugated metal container of variable volume having a continuous self-sustaining wall enclosing a body of fire extinguishing liquid, a nozzle communicating with the interior of said container, a valve controlling the flow of liquid from the container to the nozzle, and means tending to contract said container so that the liquid is forcibly projected from the nozzle on the opening of said valve.

10. A fire extinguisher, comprising a corrugated metal container of variable volume containing a body of fire extinguishing liquid and having a resilient wall tending to move inwardly under its inherent resiliency to enclose the body of liquid continuously under pressure, a nozzle mounted directly on the container and communicating with the interior of said container, and a valve controlling the flow of liquid from the container to the nozzle so that the liquid is forcibly projected from the nozzle on the opening of said valve.

In testimony whereof I have hereunto set my hand.

ALFRED L. LOOMIS.